In the Claims

1. (Previously Presented) A photonic lead system, comprising:

a photonic lead having a distal end, a proximal end, and an optical communication channel between said distal end and said proximal end;

a magnetic radiation coil, located in said distal end, to generate an electrical current corresponding to magnetic radiation characteristics of a predetermined nature; and

a converter to convert said electrical signal generated by said magnetic radiation coil to an optical signal, said optical signal to be propagated along said optical communication channel from said distal end to said proximal end.

2. (Previously Presented) The photonic lead system as claimed in claim 1, further comprising:

a second magnetic radiation coil, located in said distal end, to generate an electrical current corresponding to magnetic radiation characteristics of a second predetermined nature.

3. (Previously Presented) The photonic lead system as claimed in claim 1, further comprising:

a second magnetic radiation coil, located in said distal end, to generate an electrical current corresponding to magnetic radiation characteristics of a second predetermined nature; and

a third magnetic radiation coil, located in said distal end, to generate an electrical current corresponding to magnetic radiation characteristics of a third predetermined nature.

4. (Original) The photonic lead system as claimed in claim 1, wherein said magnetic radiation coil is rotatable within said photonic lead.

5. (Previously Presented) The photonic lead system as claimed in claim 2, wherein said second magnetic radiation coil being positioned within said photonic lead to form a predetermined angle with respect to said magnetic radiation coil.

6. (Original) The photonic lead system as claimed in claim 2, wherein said second magnetic radiation coil being positioned within said photonic lead to be substantially perpendicular to said magnetic radiation coil.

7. (Previously Presented) The photonic lead system as claimed in claim 1, further comprising:

an amplifier operatively connected to said magnetic coil; and

a control circuit, operatively connected to said amplifier and said converter, to produce control signals corresponding to the characteristics of the magnetic radiation.

8. (Previously Presented) The photonic lead system as claimed in claim 7, further comprising:

a light source, operatively connected to said optical communication channel and located in the proximal end of said photonic lead, to produce a first light having a first wavelength and a second light having a second wavelength;

said converter including a distal sensor, in the distal end of said photonic lead;

said distal sensor converting the first light into electrical energy and, responsive to said control signals, reflecting the second light back the proximal end of said photonic lead through said optical communication channel such that a characteristic of the second light is modulated to encode the characteristics of the magnetic radiation.

9. (Original) The photonic lead system as claimed in claim 8, further comprising:

a proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

10. (Previously Presented) The photonic lead system as claimed in claim 9, further comprising:

a transmitter, in the proximal end of said photonic lead and operatively connected to said proximal sensor, to transmit, in response the electrical energy from the converted modulated second light, information representing the characteristics of the magnetic radiation.

11. (Original) The photonic lead system as claimed in claim 8, wherein said light source includes a first emitter to emit the first light having the first wavelength and a second emitter to emit the second light having the second wavelength.

12. (Original) The photonic lead system as claimed in claim 8, wherein said light source includes a first laser to produce the first light having the first wavelength and a second laser to produce the second light having the second wavelength.

13. (Previously Presented) The photonic lead system as claimed in claim 8, wherein said distal sensor includes:

an optical attenuator coupled to a mirror; and

an optical-electrical conversion device to convert the first light into electrical energy;

said optical attenuator attenuating the second light to encode the characteristics of the magnetic radiation.

14. (Previously Presented) The photonic lead system as claimed in claim 13, wherein said optical attenuator attenuating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the characteristics of the magnetic radiation.

15. (Original) The photonic lead system as claimed in claim 13, wherein said optical attenuator attenuating the second light to create light having differing intensities over a period of time.

16. (Original) The photonic lead system as claimed in claim 13, further comprising:

a beam splitter to direct the second light to said optical feedback device and to direct said first light to said optical-electrical conversion device.

17. (Original) The photonic lead system as claimed in claim 13, wherein said optical attenuator comprises liquid crystal material having a variable optical transmission density responsive to applied electrical voltage.

18. (Previously Presented) The photonic lead system as claimed in claim 8, wherein said distal sensor includes:

a variable reflectance optical reflector; and

an optical-electrical conversion device to convert the first light into electrical energy;

said variable reflectance optical reflector variably reflecting the second light to encode the characteristics of the magnetic radiation.

19. (Previously Presented) The photonic lead system as claimed in claim 18, wherein said variable reflectance optical reflector variably reflecting the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the characteristics of the magnetic radiation.

20. (Original) The photonic lead system as claimed in claim 18, wherein said variable reflectance optical reflector variably reflecting the second light to create light having differing intensities over a period of time.

21. (Original) The photonic lead system as claimed in claim 17, further comprising:

a beam splitter to direct the second light to said variable reflectance optical reflector and to direct said first light to said optical-electrical conversion device.

22. (Previously Presented) The photonic lead system as claimed in claim 8, wherein said distal sensor includes an optical-electrical conversion device to convert the first light into electrical energy and a variable reflectance optical reflector overlaying said optical-electrical conversion device;

said variable reflectance optical reflector variably reflecting the second light to encode the characteristics of the magnetic radiation and being optically transparent to said first light.

23. (Previously Presented) The photonic lead system as claimed in claim 22, wherein said variable reflectance optical reflector variably reflecting the second light to create pulses of light

having equal intensity and periods of no light, the periods of no light differing in time in response to the characteristics of the magnetic radiation.

24. (Original) The photonic lead system as claimed in claim 22, wherein said variable reflectance optical reflector variably reflecting the second light to create light having differing intensities over a period of time.

25. (Previously Presented) The photonic lead system as claimed in claim 8, wherein said optical communication channel is a fiber optic.

26. (Previously Presented) The photonic lead system as claimed in claim 8, wherein said optical communication channel includes a first fiber optic to transmit the first light and a second fiber optic to transmit the second light.

27. (Previously Presented) The photonic lead system as claimed in claim 8, wherein said optical communication channel is a bundle of fiber optics.

28. (Previously Presented) The photonic lead system as claimed in claim 7, further comprising:

a light source, operatively connected to said optical communication channel and located in the proximal end of said photonic lead, to produce a first light having a first wavelength;

said converter including a distal sensor, in the distal end of said photonic lead;

said distal sensor converting the first light into electrical energy and, responsive to said control signals, emitting a second light having a second wavelength to proximal end of said photonic lead such that a characteristic of the second light is modulated to encode the characteristics of the magnetic radiation.

29. (Original) The photonic lead system as claimed in claim 28, further comprising:

a proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

30. (Previously Presented) The photonic lead system as claimed in claim 28, further comprising:

a transmitter, in the proximal end of said photonic lead and operatively connected to said proximal sensor, to transmit, in response the electrical energy from the converted modulated second light, information representing the characteristics of the magnetic radiation.

31. (Original) The photonic lead system as claimed in claim 28, wherein said light source includes a laser to produce the first light having the first wavelength and said distal sensor includes a second laser to produce the second light having the second wavelength.

32. (Previously Presented) The photonic lead system as claimed in claim 28, wherein said distal sensor includes:

an emitter to produce the second light having the second wavelength; and

an optical-electrical conversion device to convert the first light into electrical energy;

said emitter modulating the second light to encode the characteristics of the magnetic radiation.

33. (Previously Presented) The photonic lead system as claimed in claim 32, wherein said emitter modulating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the characteristics of the magnetic radiation.

34. (Original) The photonic lead system as claimed in claim 32, wherein said emitter modulating the second light to create light having differing intensities over a period of time.

35. (Previously Presented) The photonic lead system as claimed in claim 28, wherein said distal sensor includes:

an on-axis emitter to produce the second light having the second wavelength; and

an on-axis optical-electrical conversion device to convert the first light into electrical energy;

said on-axis emitter modulating the second light to encode the characteristics of the magnetic radiation.

36. (Previously Presented) The photonic lead system as claimed in claim 25, wherein said on-axis emitter modulating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the characteristics of the magnetic radiation.

37. (Original) The photonic lead system as claimed in claim 35, wherein said on-axis emitter modulating the second light to create light having differing intensities over a period of time.

38. (Previously Presented) The photonic lead system as claimed in claim 28, wherein said distal sensor includes:

an off-axis emitter to produce the second light having the second wavelength; and

an on-axis optical-electrical conversion device to convert the first light into electrical energy;

said off-axis emitter modulating the second light to encode the characteristics of the magnetic radiation.

39. (Previously Presented) The photonic lead system as claimed in claim 38, wherein said off-axis emitter modulating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the characteristics of the magnetic radiation.

40. (Original) The photonic lead system as claimed in claim 38, wherein said off-axis emitter modulating the second light to create light having differing intensities over a period of time.

41. (Previously Presented) The photonic lead system as claimed in claim 38, further comprising:

a beam splitter to direct the second light to said optical communication channel and to direct said first light to said on-axis optical-electrical conversion device.

42. (Original) The photonic lead system as claimed in claim 28, further comprising:

an on-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

43. (Original) The photonic lead system as claimed in claim 28, further comprising:

an on-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy;

said light source being on-axis.

44. (Original) The photonic lead system as claimed in claim 28, further comprising:

an off-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

45. (Original) The photonic lead system as claimed in claim 28, further comprising:

an on-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy;

said on-axis proximal sensor being optically transparent to the first light.

46. (Previously Presented) The photonic lead system as claimed in claim 28, wherein said optical communication channel is a fiber optic.

47. (Previously Presented) The photonic lead system as claimed in claim 28, wherein said optical communication channel includes a first fiber optic to transmit the first light and a second fiber optic to transmit the second light.

48. (Previously Presented) The photonic lead system as claimed in claim 28, wherein said optical communication channel is a bundle of fiber optics.

Claim 49 (Cancelled)

50. (Currently Amended) A ~~The~~ photonic lead system ~~as claimed in claim 49, further~~ comprising:

a photonic lead having a distal end and a proximal end;

a magnetic radiation coil, located in said distal end, to detect characteristics of magnetic radiation of a predetermined nature;

an amplifier operatively connected to said magnetic coil;

a control circuit, operatively connected to said amplifier, to produce control signals corresponding to the detected characteristics of the magnetic radiation;

a light source, located in the proximal end of said photonic lead, to produce a first light having a first wavelength and a second light having a second wavelength;

a wave-guide between the proximal end and distal end of said photonic lead; and

a distal sensor, in the distal end of said photonic lead, to convert the first light into electrical energy and, responsive to said control signals, to reflect the second light back the proximal end of said photonic lead such that a characteristic of the second light is modulated to encode the detected characteristics of the magnetic radiation.

51. (Previously Presented) The photonic lead system as claimed in claim 50, further comprising:

a proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

52. (Previously Presented) The photonic lead system as claimed in claim 51, further comprising:

a transmitter, in the proximal end of said photonic lead and operatively connected to said proximal sensor, to transmit, in response the electrical energy from the converted modulated second light, information representing the detected characteristics of the magnetic radiation.

53. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said light source includes a first emitter to emit the first light having the first wavelength and a second emitter to emit the second light having the second wavelength.

54. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said light source includes a first laser to produce the first light having the first wavelength and a second laser to produce the second light having the second wavelength.

55. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said distal sensor includes:

an optical attenuator coupled to a mirror; and

an optical-electrical conversion device to convert the first light into electrical energy;

said optical attenuator attenuating the second light to encode the detected characteristics of the magnetic radiation.

56. (Previously Presented) The photonic lead system as claimed in claim 55, wherein said optical attenuator attenuating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the detected characteristics of the magnetic radiation.

57. (Previously Presented) The photonic lead system as claimed in claim 55, wherein said optical attenuator attenuating the second light to create light having differing intensities over a period of time.

58. (Previously Presented) The photonic lead system as claimed in claim 55, further comprising:

a beam splitter to direct the second light to said optical feedback device and to direct said first light to said optical-electrical conversion device.

59. (Previously Presented) The photonic lead system as claimed in claim 55, wherein said optical attenuator comprises liquid crystal material having a variable optical transmission density responsive to applied electrical voltage.

60. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said distal sensor includes:

a variable reflectance optical reflector; and

an optical-electrical conversion device to convert the first light into electrical energy;

said variable reflectance optical reflector variably reflecting the second light to encode the detected characteristics of the magnetic radiation.

61. (Previously Presented) The photonic lead system as claimed in claim 60, wherein said variable reflectance optical reflector variably reflecting the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the detected characteristics of the magnetic radiation.

62. (Previously Presented) The photonic lead system as claimed in claim 60, wherein said variable reflectance optical reflector variably reflecting the second light to create light having differing intensities over a period of time.

63. (Previously Presented) The photonic lead system as claimed in claim 59, further comprising:

a beam splitter to direct the second light to said variable reflectance optical reflector and to direct said first light to said optical-electrical conversion device.

64. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said distal sensor includes an optical-electrical conversion device to convert the first light into electrical energy and a variable reflectance optical reflector overlaying said optical-electrical conversion device;

said variable reflectance optical reflector variably reflecting the second light to encode the detected characteristics of the magnetic radiation and being optically transparent to said first light.

65. (Previously Presented) The photonic lead system as claimed in claim 64, wherein said variable reflectance optical reflector variably reflecting the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the detected characteristics of the magnetic radiation.

66. (Previously Presented) The photonic lead system as claimed in claim 64, wherein said variable reflectance optical reflector variably reflecting the second light to create light having differing intensities over a period of time.

67. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said wave-guide is a fiber optic.

68. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said wave-guide includes a first fiber optic to transmit the first light and a second fiber optic to transmit the second light.

69. (Previously Presented) The photonic lead system as claimed in claim 50, wherein said wave-guide is a bundle of fiber optics.

70. (Previously Presented) The photonic lead system as claimed in claim 7, further comprising:

a light source, located in the proximal end of said photonic lead, to produce a first light having a first wavelength

a wave-guide between the proximal end and distal end of said photonic lead; and

a distal sensor, in the distal end of said photonic lead, to convert the first light into electrical energy and, responsive to said control signals, to emit a second light having a second wavelength to proximal end of said photonic lead such that a characteristic of the second light is modulated to encode the detected characteristics of the magnetic radiation.

71. (Previously Presented) The photonic lead system as claimed in claim 70, further comprising:

a proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

72. (Previously Presented) The photonic lead system as claimed in claim 70, further comprising:

a transmitter, in the proximal end of said photonic lead and operatively connected to said proximal sensor, to transmit, in response the electrical energy from the converted modulated second light, information representing the detected characteristics of the magnetic radiation.

73. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said light source includes a laser to produce the first light having the first wavelength and said distal sensor includes a second laser to produce the second light having the second wavelength.

74. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said distal sensor includes:

an emitter to produce the second light having the second wavelength; and

an optical-electrical conversion device to convert the first light into electrical energy;

said emitter modulating the second light to encode the detected characteristics of the magnetic radiation.

75. (Previously Presented) The photonic lead system as claimed in claim 74, wherein said emitter modulating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the detected characteristics of the magnetic radiation.

76. (Previously Presented) The photonic lead system as claimed in claim 74, wherein said emitter modulating the second light to create light having differing intensities over a period of time.

77. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said distal sensor includes:

an on-axis emitter to produce the second light having the second wavelength; and

an on-axis optical-electrical conversion device to convert the first light into electrical energy;

said on-axis emitter modulating the second light to encode the detected characteristics of the magnetic radiation.

78. (Previously Presented) The photonic lead system as claimed in claim 77, wherein said on-axis emitter modulating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the detected characteristics of the magnetic radiation.

79. (Previously Presented) The photonic lead system as claimed in claim 77, wherein said on-axis emitter modulating the second light to create light having differing intensities over a period of time.

80. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said distal sensor includes:

an off-axis emitter to produce the second light having the second wavelength; and

an on-axis optical-electrical conversion device to convert the first light into electrical energy;

said off-axis emitter modulating the second light to encode the detected characteristics of the magnetic radiation.

81. (Previously Presented) The photonic lead system as claimed in claim 80, wherein said off-axis emitter modulating the second light to create pulses of light having equal intensity and periods of no light, the periods of no light differing in time in response to the detected characteristics of the magnetic radiation.

82. (Previously Presented) The photonic lead system as claimed in claim 80, wherein said off-axis emitter modulating the second light to create light having differing intensities over a period of time.

83. (Previously Presented) The photonic lead system as claimed in claim 80, further comprising:

a beam splitter to direct the second light to said wave-guide and to direct said first light to said on-axis optical-electrical conversion device.

84. (Previously Presented) The photonic lead system as claimed in claim 70, further comprising:

an on-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

85. (Previously Presented) The photonic lead system as claimed in claim 70, further comprising:

an on-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy;

said light source being on-axis.

86. (Previously Presented) The photonic lead system as claimed in claim 70, further comprising:

an off-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy.

87. (Previously Presented) The photonic lead system as claimed in claim 70, further comprising:

an on-axis proximal sensor, in the proximal end of said photonic lead, to convert the modulated second light into electrical energy;

said on-axis proximal sensor being optically transparent to the first light.

88. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said wave-guide is a fiber optic.

89. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said wave-guide includes a first fiber optic to transmit the first light and a second fiber optic to transmit the second light.

90. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said wave-guide is a bundle of fiber optics.

91. (Previously Presented) The photonic lead system as claimed in claim 70, further comprising:

an electrical lead connected to control circuit and said proximal end so that said control signals propagate to said proximal end through said electrical lead.

92. (Previously Presented) The photonic lead system as claimed in claim 70, wherein said electrical lead is shielded.

93. (Previously Presented) The photonic lead system as claimed in claim 91, wherein said electrical lead includes an electrical filter, said electrical filter removing stray electromagnetic interference from said control signals being propagated to said proximal end through said electrical lead.

94. (Previously Presented) The photonic lead system as claimed in claim 92, wherein said electrical lead includes an electrical filter, said electrical filter removing stray electromagnetic interference from said control signals being propagated to said proximal end through said electrical lead.

95. (Previously Presented) The photonic lead system as claimed in claim 92, wherein the shielding around said electrical lead is a metallic sheath to prevent said electrical lead from conducting stray electromagnetic interference.

96. The photonic lead system as claimed in claim 92, wherein the shielding around said electrical lead is a carbon composite sheath to prevent said electrical lead from conducting stray electromagnetic interference.

97. The photonic lead system as claimed in claim 92, wherein the shielding around said electrical lead is a polymer composite sheath to prevent said electrical lead from conducting stray electromagnetic interference.

98. (Previously Presented) The photonic lead system as claimed in claim 94, wherein the shielding around said electrical lead is a metallic sheath to prevent said electrical lead from conducting stray electromagnetic interference.

99. The photonic lead system as claimed in claim 94, wherein the shielding around said electrical lead is a carbon composite sheath to prevent said electrical lead from conducting stray electromagnetic interference.

100. The photonic lead system as claimed in claim 94, wherein the shielding around said electrical lead is a polymer composite sheath to prevent said electrical lead from conducting stray electromagnetic interference.

Claims 101-110 (Cancelled)